EOSDIS Core System

Architecture Overview

Ron Williamson

Mission to Planet Earth

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EOS

AM-1 | PM-1 | CHEM-1

AM-2 | PM-2 | LASER ALT

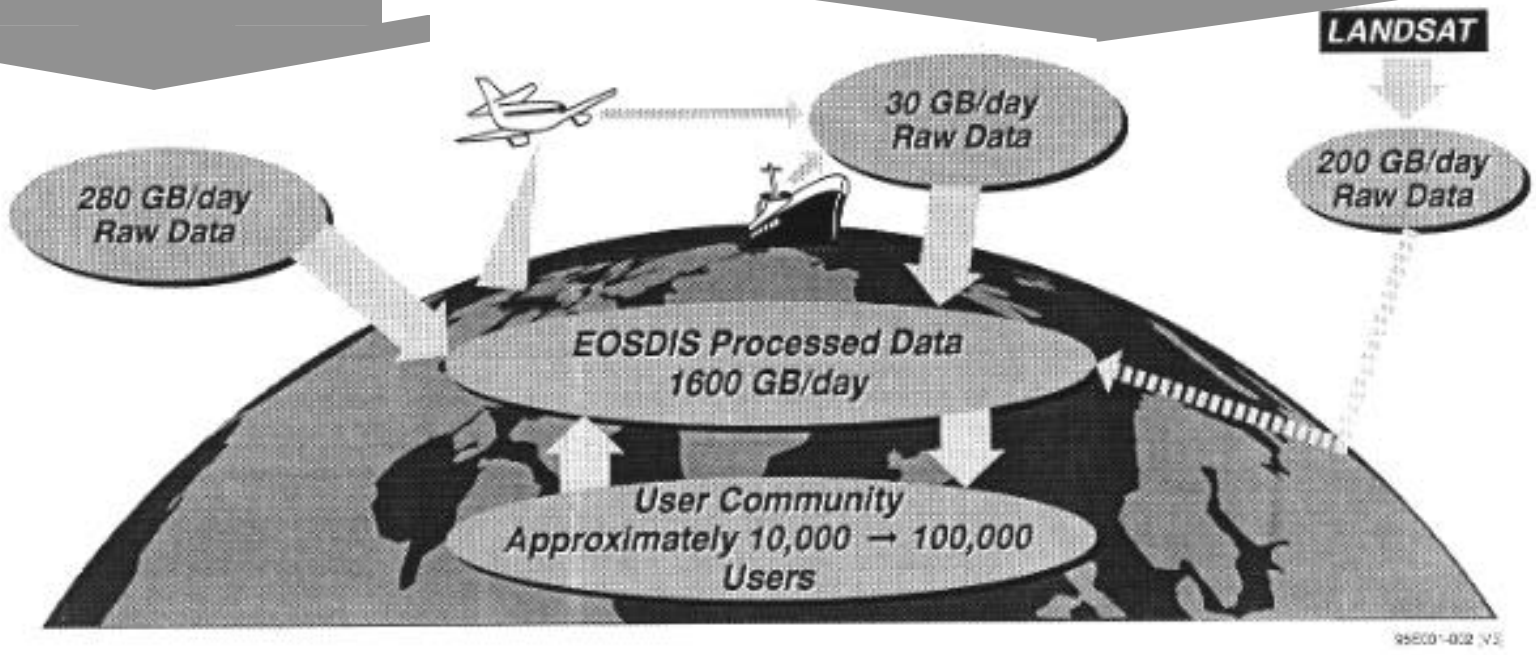
International Platforms

Other NASA/MTPE Missions and Instruments

UARS | TRMM | NSCAT | TOMS | TOPEX

International Partners

ERS-1/2 | JERS-1 | Radarsat | ADEOS II | SeaWIFS



EOSDIS Distributed Active Archive Centers

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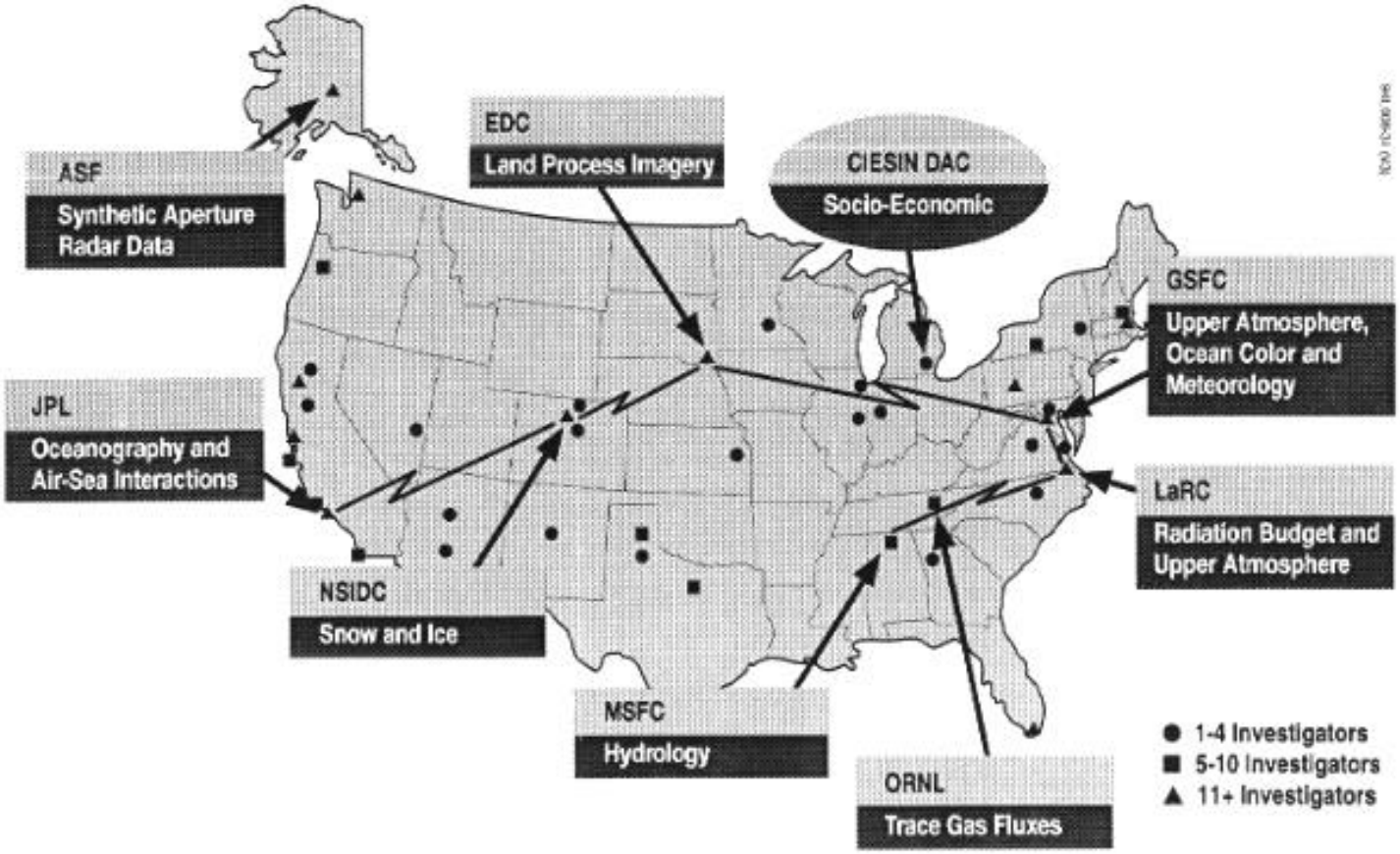

ECS Program Schedule

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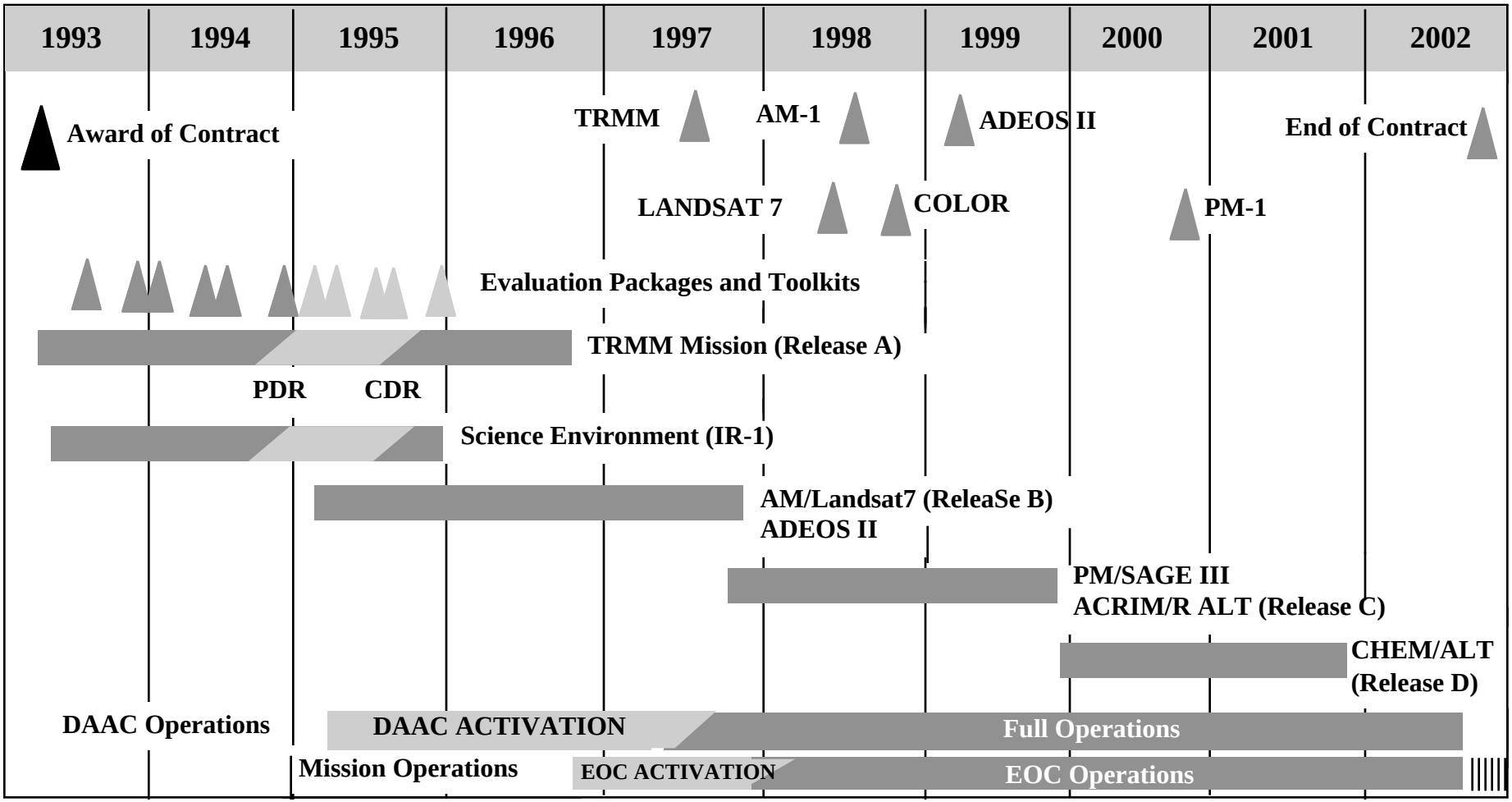

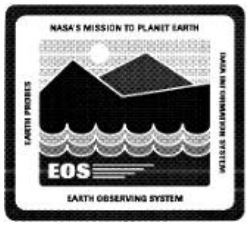

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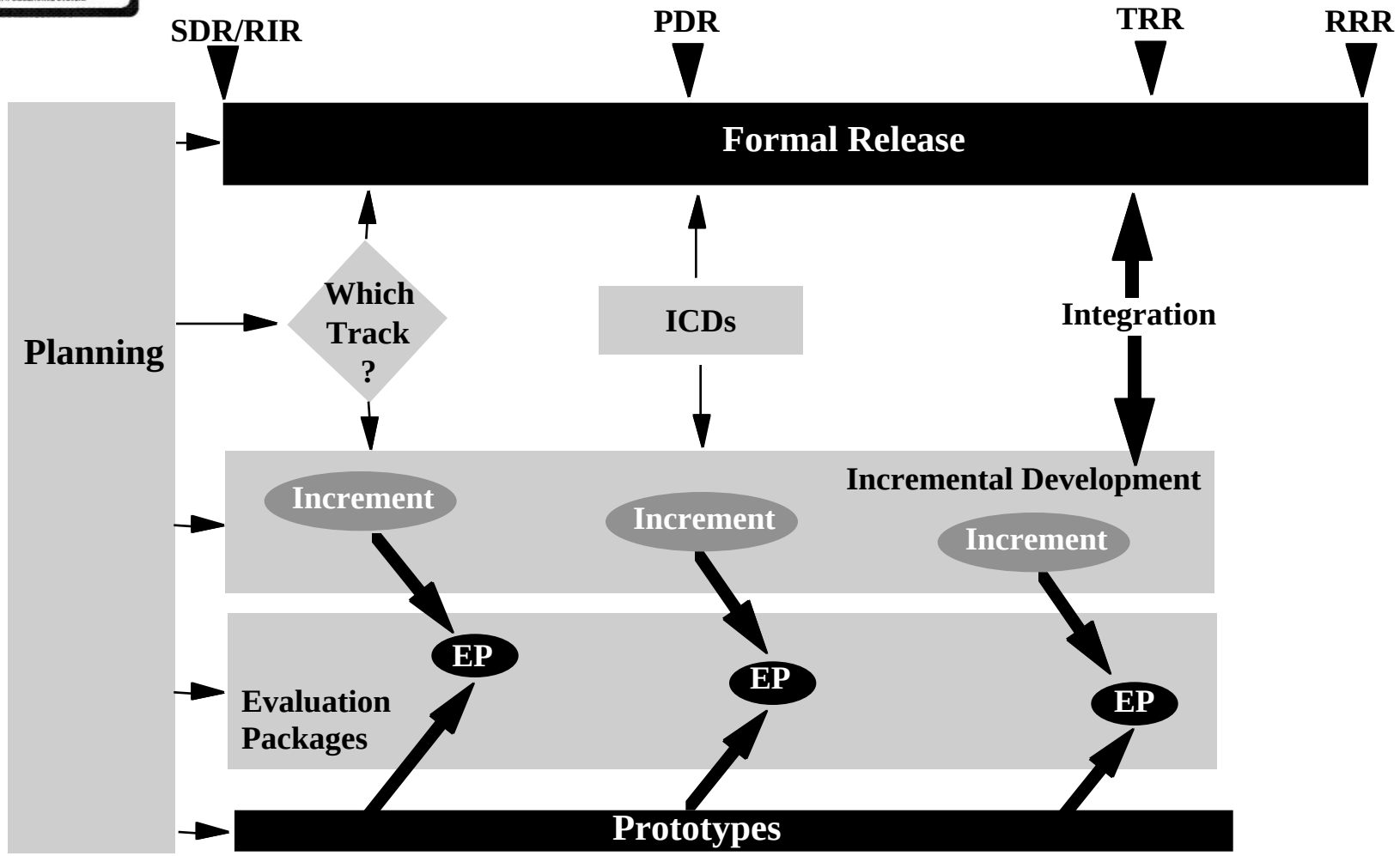
Multi-track Development



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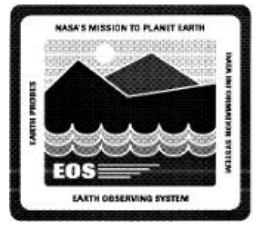
User Interaction Model



Science Researcher

Science Advisory Panel

Tirekickers

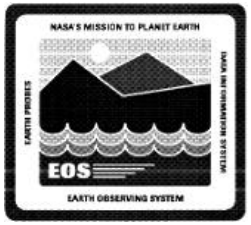
Operations Staff

Academia

- **Prototype Workshops**
- **Evaluation Packages**
- **Technical Meetings**
- **User Recommendations**
- **Ad Hoc Groups**
- **Document Review**
- **Formal Review**
- **Independent Architecture Studies**
- **NASA Funded Research**

Refined

- **Requirements**
- **Implementations**
- **Operational concepts**
- **Design**
- **Operations**
- **Architecture**
- **Technology Infusion**



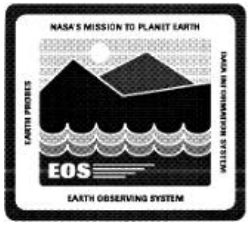
Some History

GSDIS/UserDIS Study

- **NRC:** ***"Provision of common GCDIS (and UserDIS) software, database structures, and technical infrastructure for an interoperable network"***
- **Results of Study: There are components of GCDIS/userDIS which ECS can provide without leaving its mission envelope and without a lot of additional cost, by carefully choosing the appropriate architectural direction.**

Boundaries

- **Cannot Compromise EOS Primary Mission Objectives**
  - **Must Preserve EOS Data (An Extremely Valuable National Resource)**
  - **Cannot Endanger the High-Volume Data Ingest and Production Operation**
  - **Cannot Degrade Critical Capabilities of EOS Researchers**



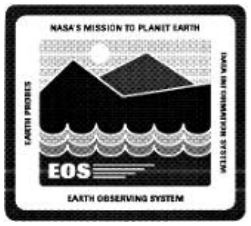
Summary - The Information System Paradigm Shift

Distributed Information Systems

- √ Locally distributed
- √ Homogeneous
- √ Centrally managed
- √ Relatively static
- √ Data searching
  - √ Standard query interfaces

Information System Federations

- Δ Globally distributed
- Δ Heterogeneous
- Δ Autonomous
- Δ Dynamic
- Δ Information discovery
  - Δ Hypermedia browse paradigms
  - Δ Automatic subscriptions
  - Δ Intelligent search agents



Key Challenges

Data

- **Diverse data types and representations**
- **Extremely large volume of data (TB/day and PB archives)**
- **Complex data product interdependencies**
- **Changes in scientific algorithms accompany increased understanding**
- **Long-term archival of data ("national resource")**

Users

- **Diverse user communities**
  - **disciplines, expertise, objectives, methods, tools**
- **Geographically distributed**
- **Widely varying computational and networking capabilities**

Other

- **Evolving technologies, data sources, and investigative approaches**
- **Federation objectives (GCDIS, UserDIS contexts)**

EOSDIS Core System Context

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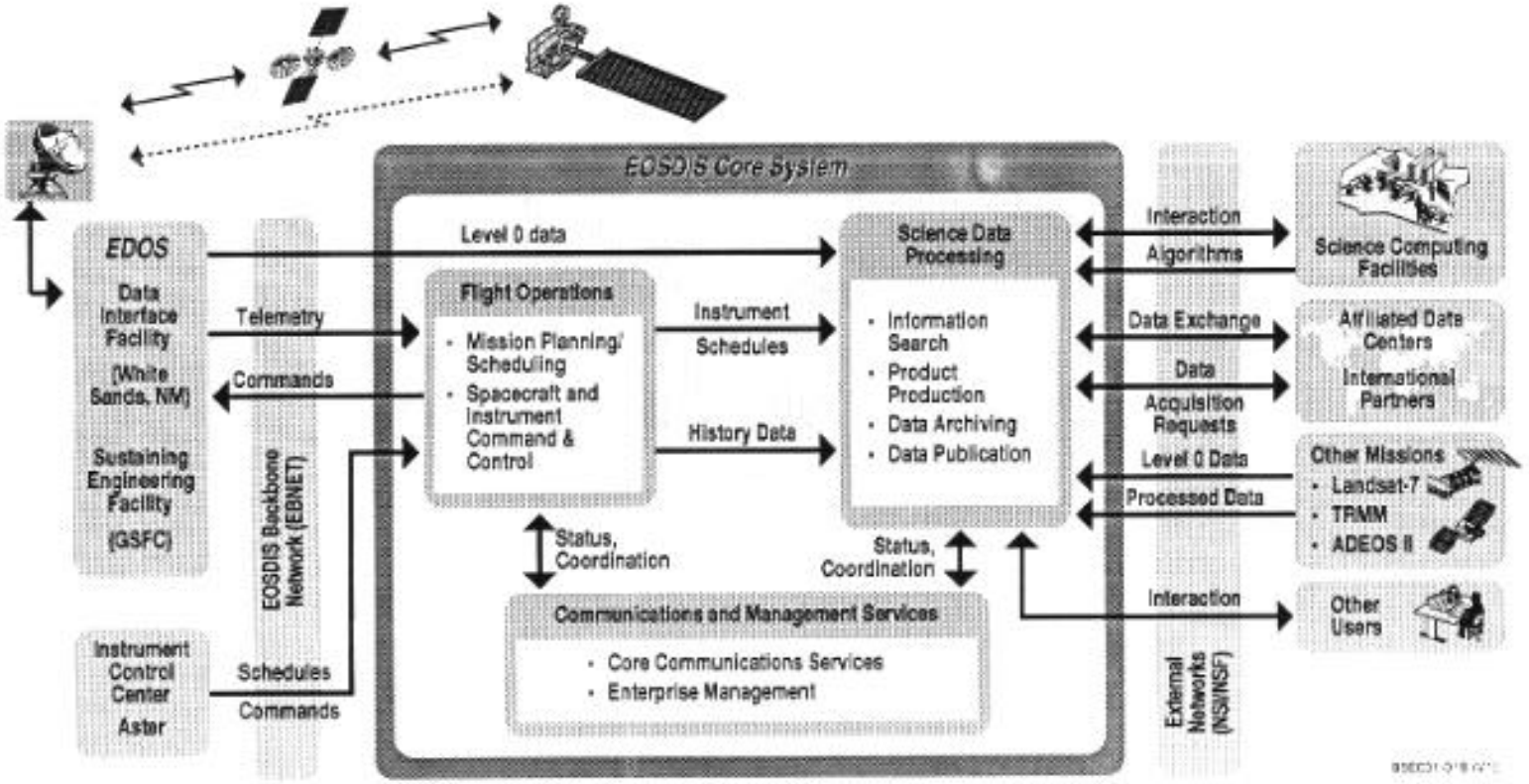
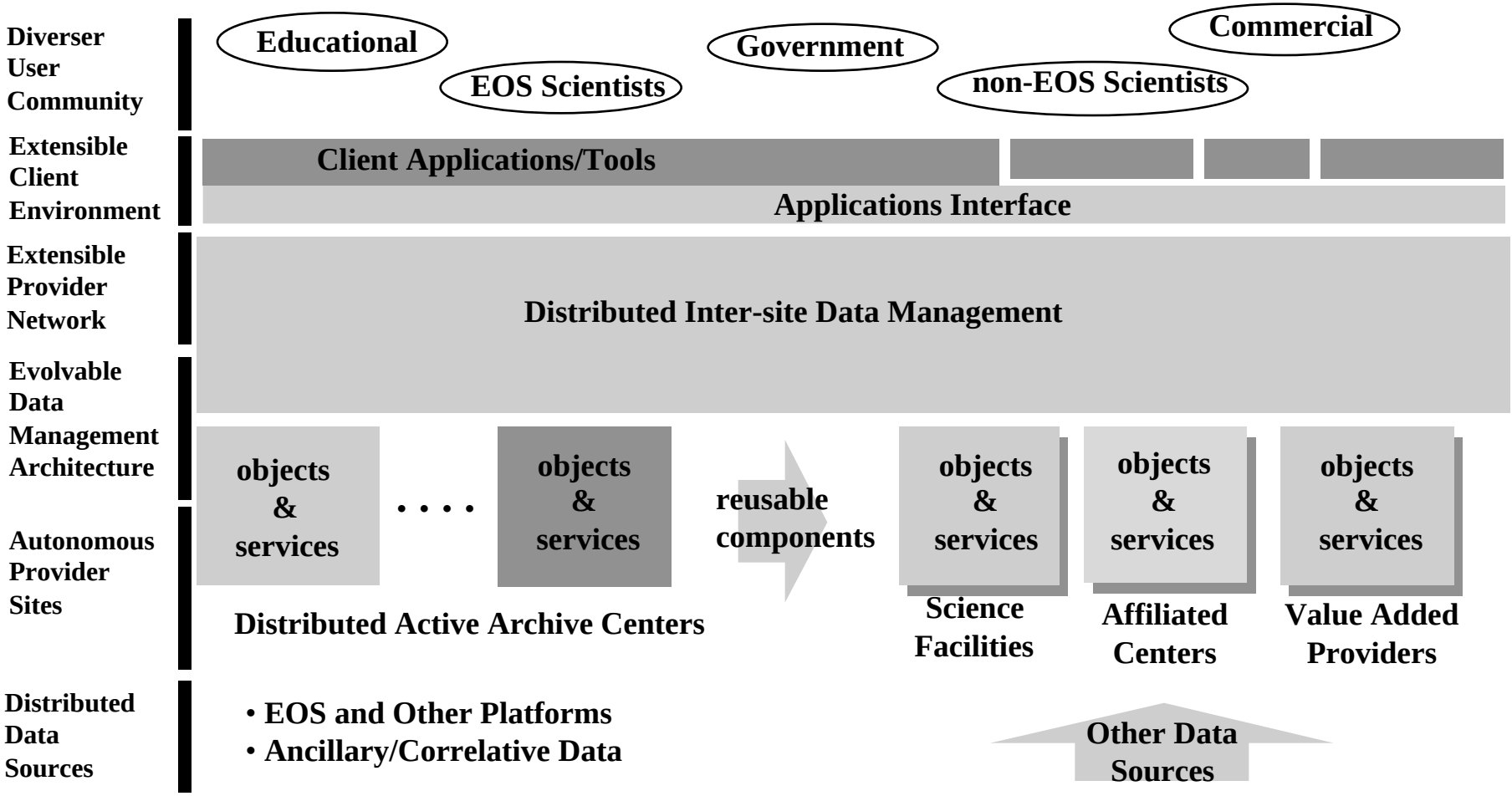


ECS Architecture



ECS Protocol Layers

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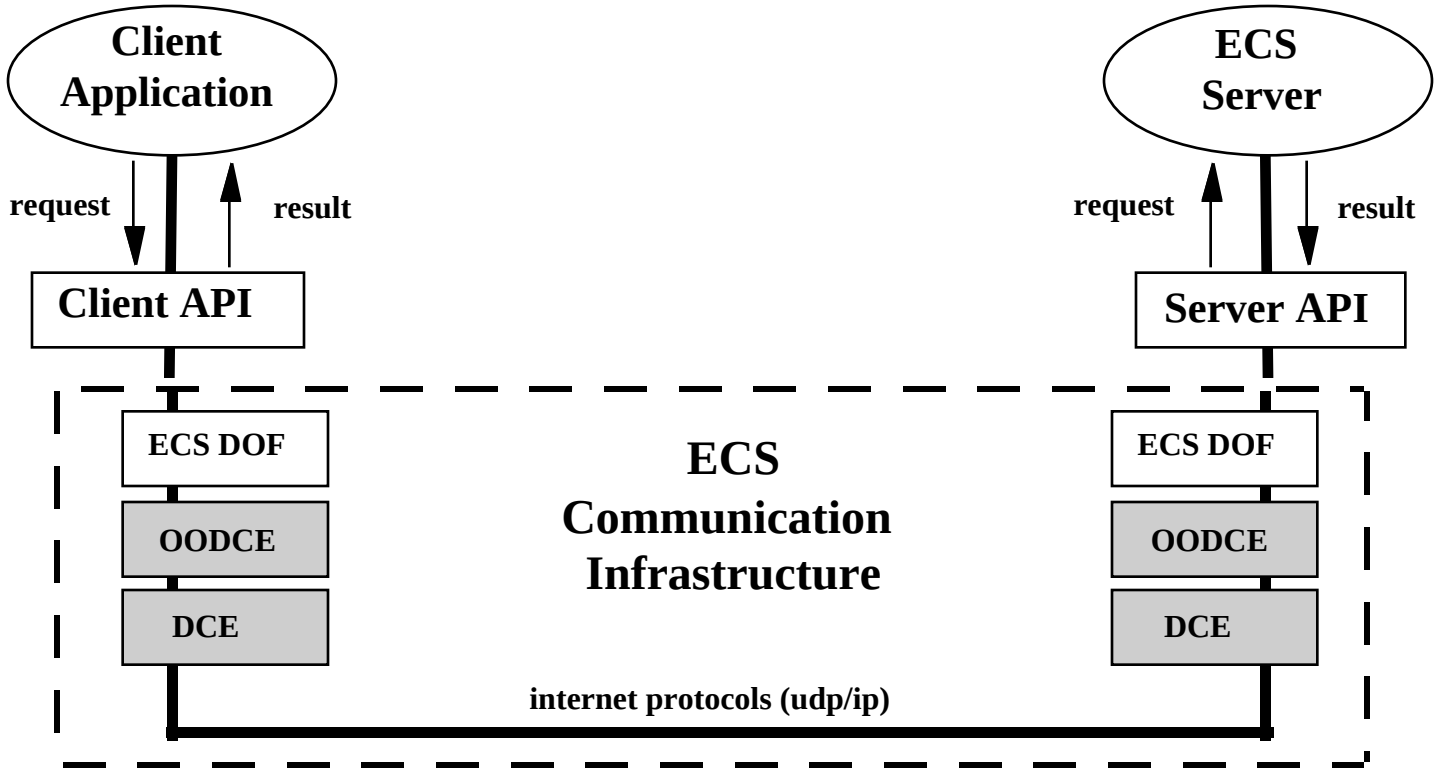

EOSDIS Data Model

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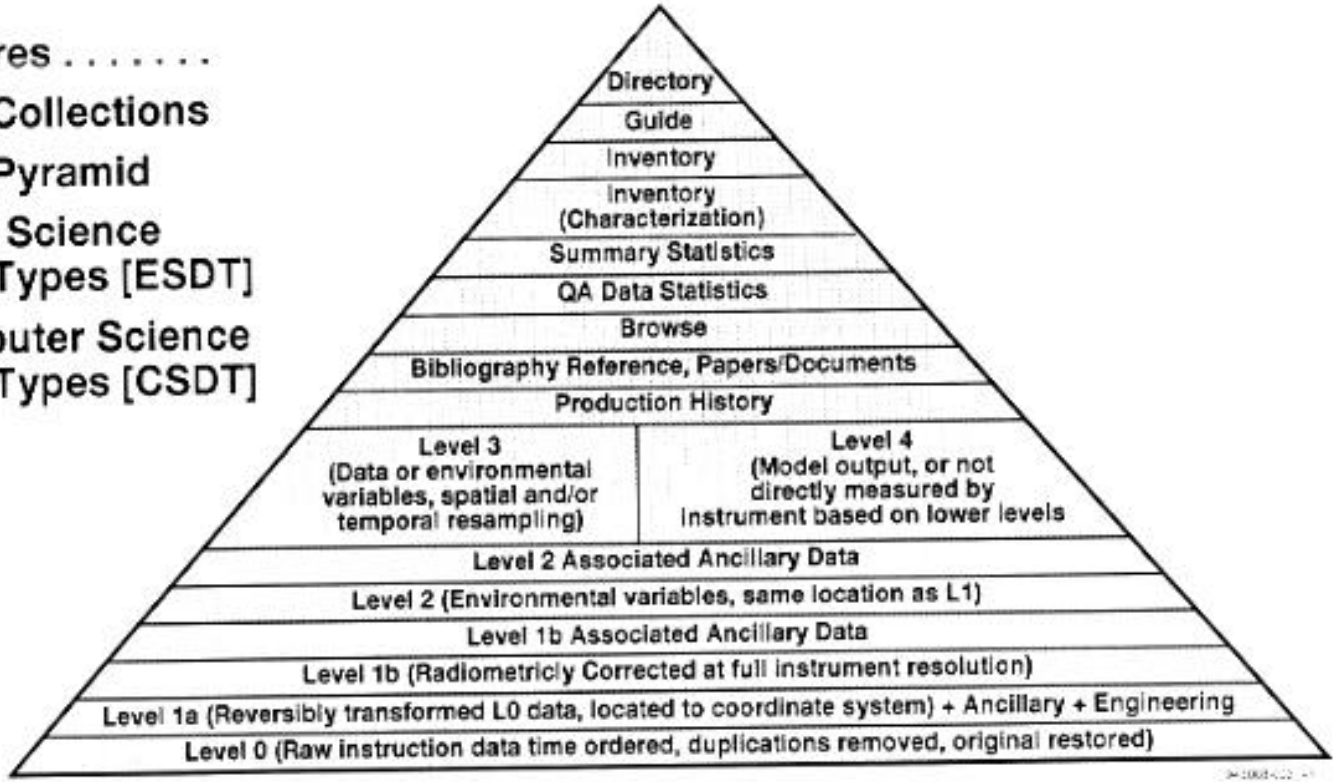
Data Model is a critical part of the overall design

Key features . . . . . .

- ❑ Data Collections
- ❑ Data Pyramid
- ❑ Earth Science Data Types [ESDT]
- ❑ Computer Science Data Types [CSDT]



*Source: ESDIS Project/NASA/GSFC

Data Center System Context

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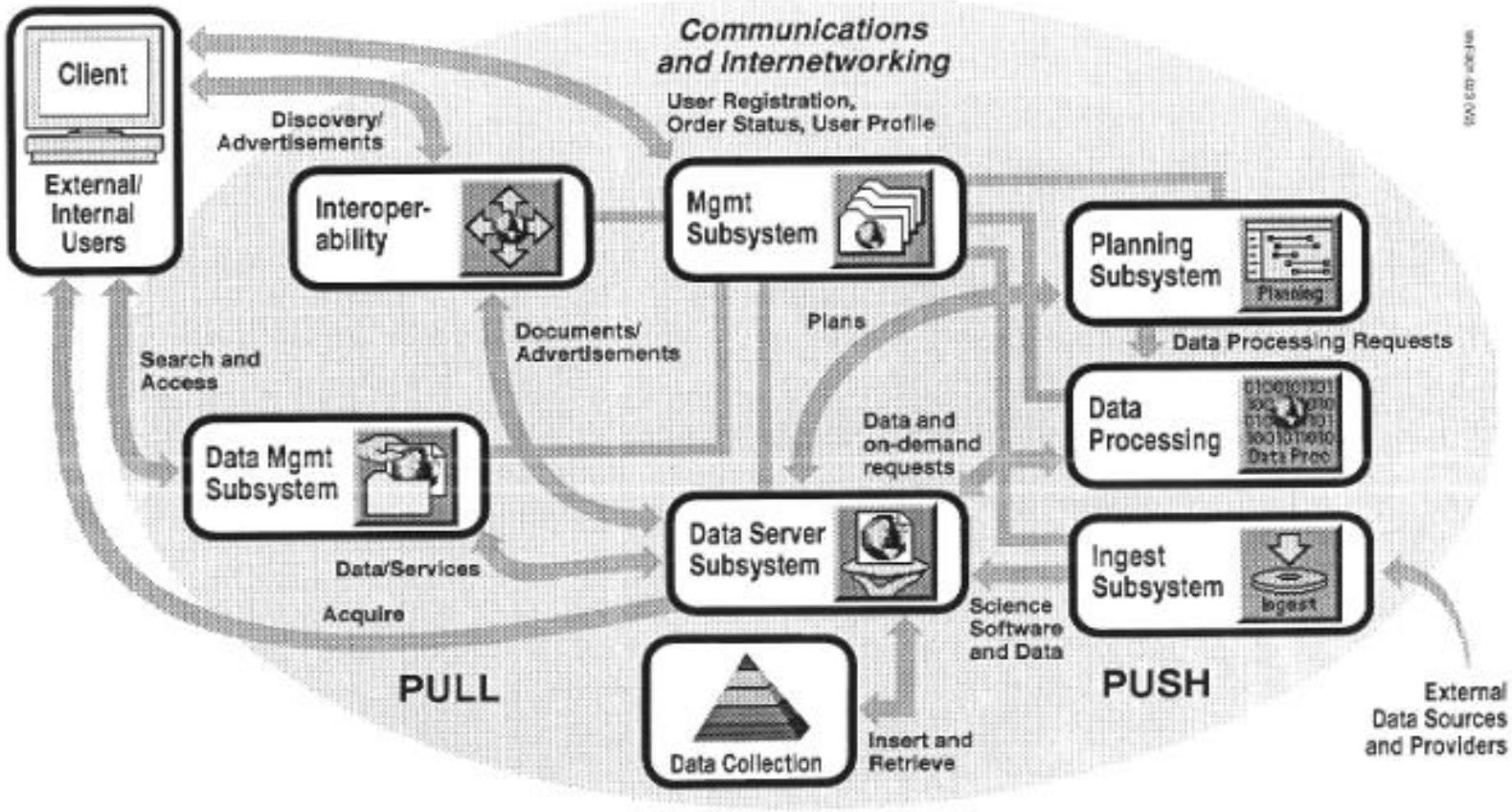

Client Overview

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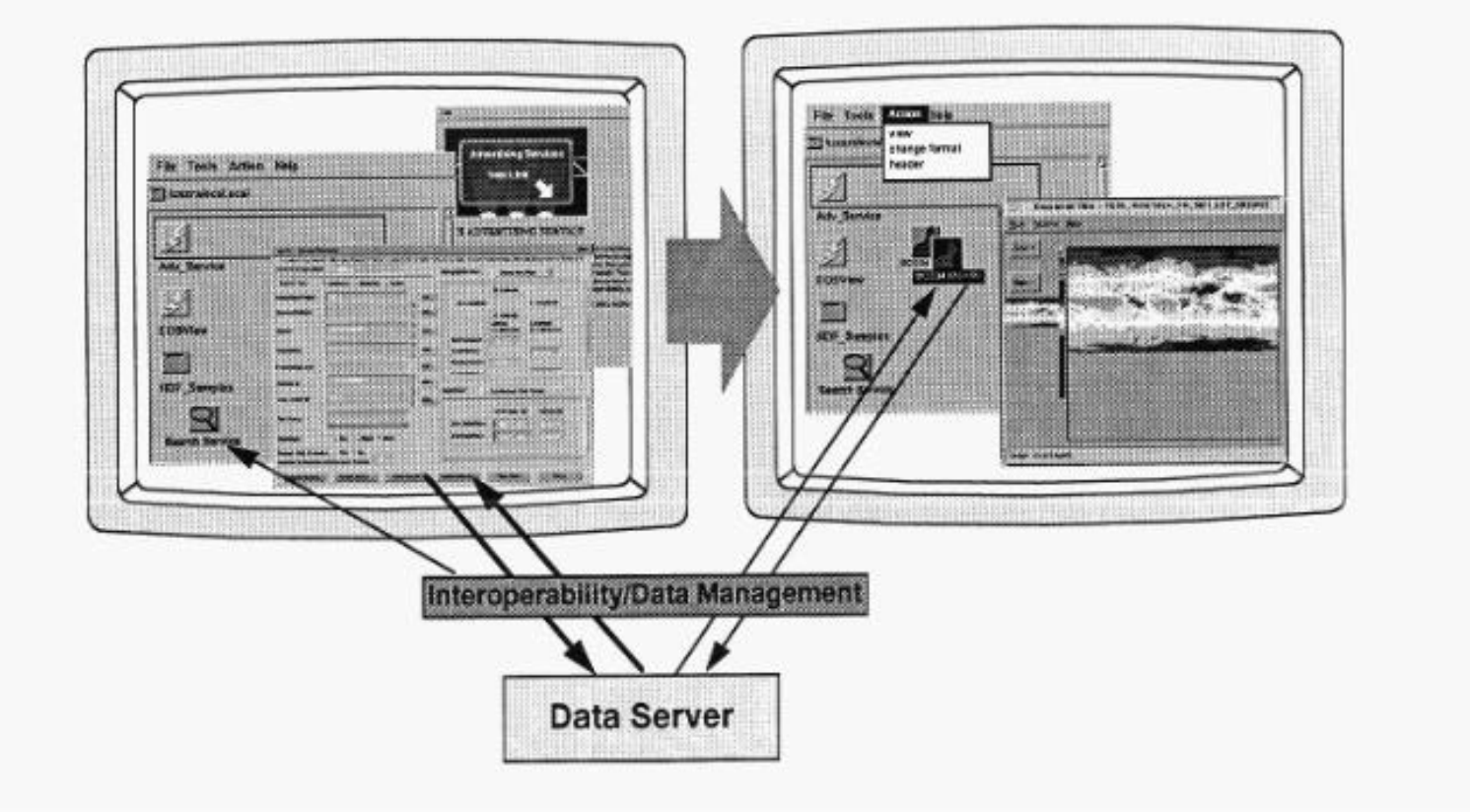

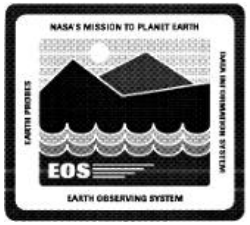

Client Capabilities

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ECS client provides search and access capabilities to ECS services

- **User access via GUI Objects**
- **Machine-to-Machine access via API libraries**

Basic ECS Desktop provides GUI framework for

- **Installation of GUI Objects and tools**
- **Tool launching and object embedding**
- **Data format translation**

Framework provides for extensibility to add

- **Science user tools and data types**
- **(GUI interfaces to) new services**

Interoperability and Data Management Overview

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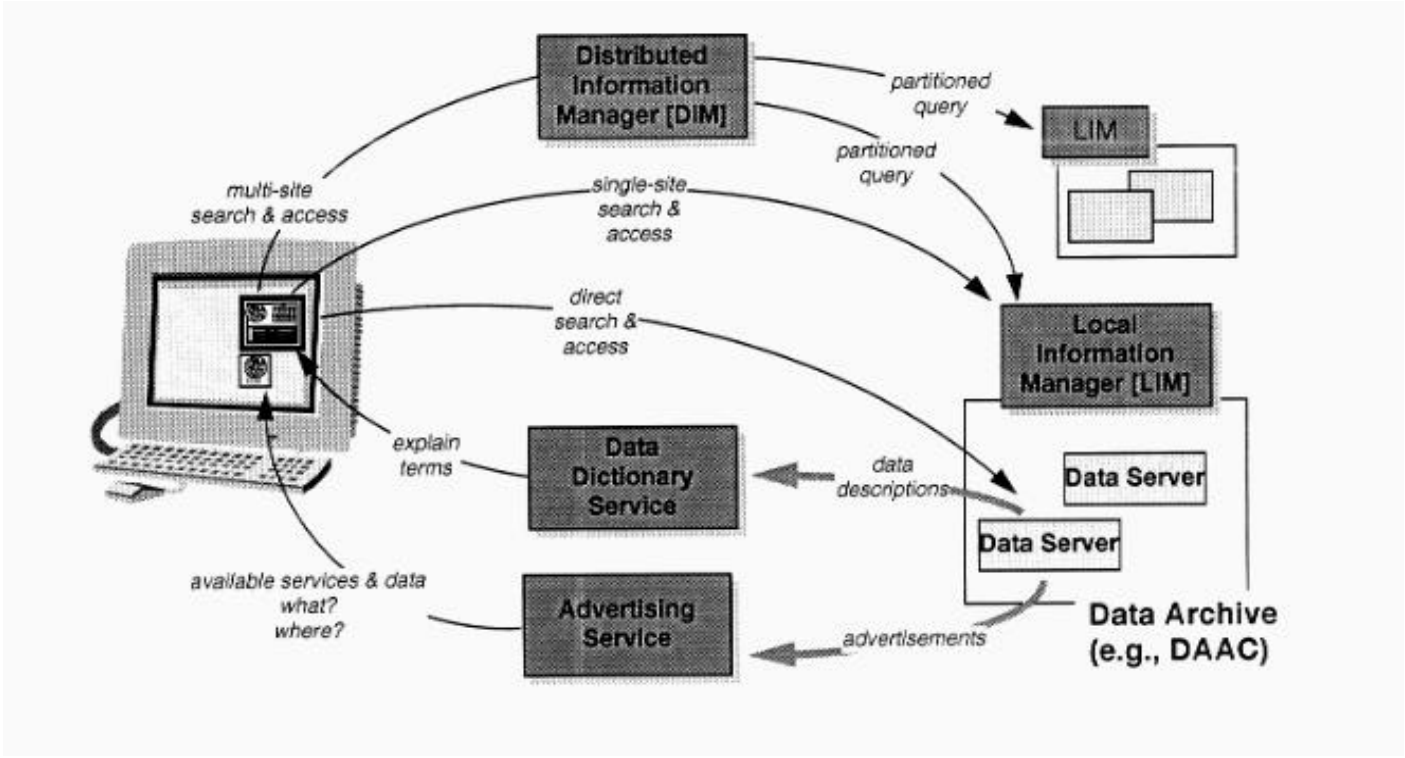

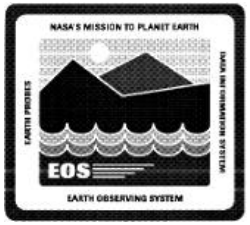

Interoperability and Data Management Capabilities

Information Discovery (Advertising Service)

- **Interactive browsing and searching of service and data collection advertisements**
- **Hypertext links to detailed documentation**
- **Retrieve service interface to desktop**

Dynamic binding of clients to services, dynamic addition/relocation of services (Interoperability)

Explain terms to support query formulation (Data Dictionary Service)

Search across data collections at a single site (Local Information Management Service)

Search across multiple sites (Distributed Information Management Service)

Data Server Overview

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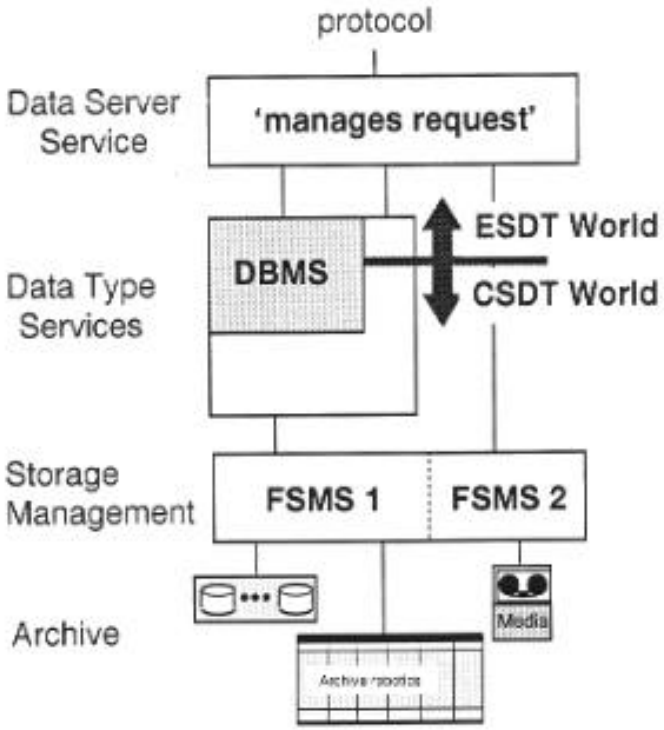

Manages data for both the PUSH and PULL aspects of EOSDIS.

Key Points

- **Receives requests in terms of ESDTs which are converted to functions on CSDTs**
- **flexibility to store and manage different types**
- **DBMS selection influences design solution**
- **highly desirable that it supports multiple FSMS**
- **highly desirable that it supports sub-file access**
- **must support multiple archive technologies**

Ingest, Planning and Processing Overview

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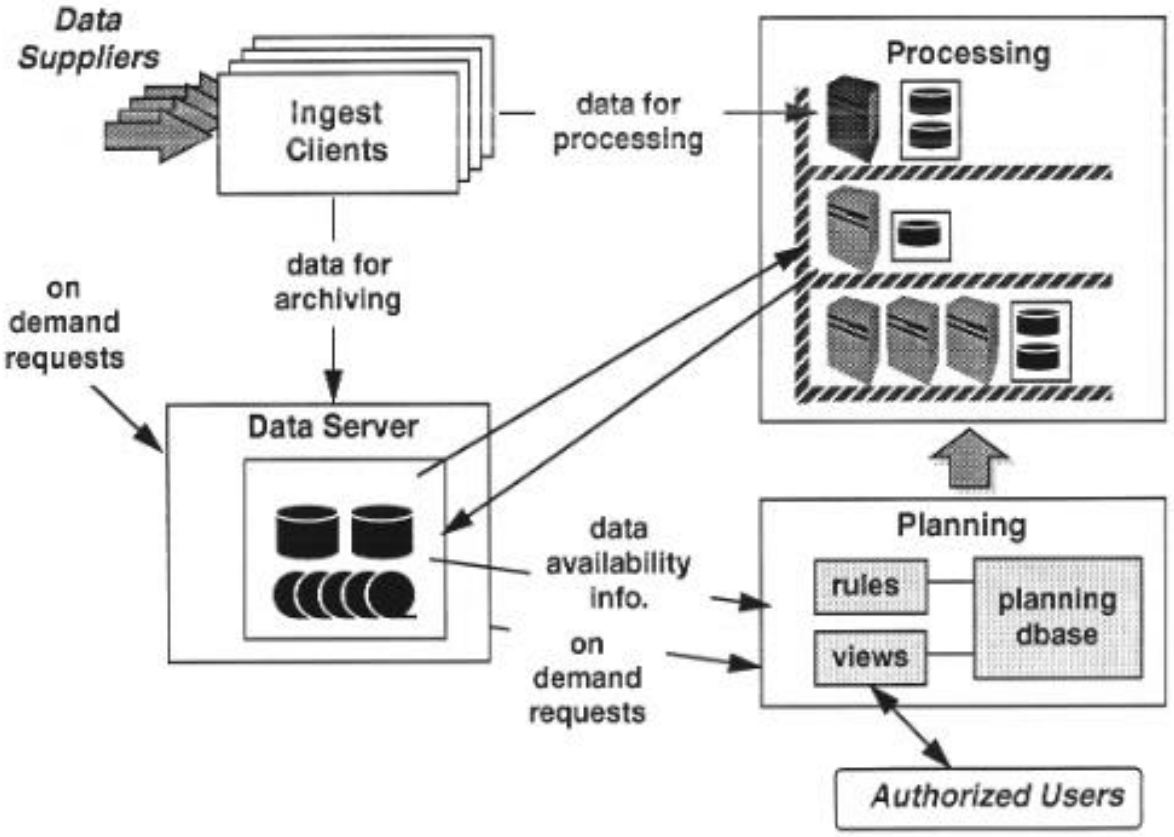

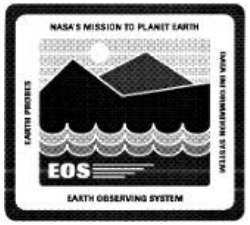

Technical Issues

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ECS uses COTS to reduce cost, but most COTS is not yet ready to support a large distributed, heterogeneous business model. Examples:

- **ECS Advertising uses COTS data replicator (Sybase)**
- **Production coordinated across DAACs using COTS (Autosys)**

ECS uses distributed objects - Gateways provide Internet access

- **Distributed Object Technology not ready yet for big time Internet use**
- **ECS is still holding off on adoption of CORBA**

Most ECS servers rely on the ECS communications and management infrastructure

- **Some re-engineering will be needed to allow them to operate in a different and loosely federated ESIS infrastructure**